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(71)Applicant : CHISSO CORP

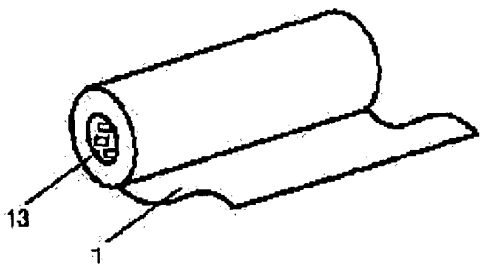
(72)Inventor : FUKUDA SHIGENORI
YAMAGUCHI OSAMU

(54) FILTER CARTRIDGE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a cylindrical filter cartridge superior in liquid passing prop erty, a filter life and stability of filtering accuracy, etc., by winding short fiber nonwoven fabric consisting of thermoplastic fibers around a porous cylindrical body in a twill shape.

SOLUTION: A filter having a structure wound with a nonwoven fabric, of wide width as it is, around the porous cylindrical body 13, the so-called nonwoven fabric laminated type filter cartridge is decided its filtering performance with the nonwoven fabric. In the case, thermoplastic fibers are used as a filter material of the filter cartridge, and their fiber cross points are formed from an adhered a band-like short fiber nonwoven fabric. Like this, since the fiber cross points are adhered, falling off of the fibers is decreased, compared to a fiber winding type filter using conventional spun yarns. Also since the band-like short fiber-made nonwoven fabric is wound around the porous cylindrical body in a twill shape, the deviation of the filtering performance in the direction of the filter length is reduced and the productivity is enhanced. Besides, pleats are provided on the band-like short fiber nonwoven fabric, then the particle collection area and the apparent vacancy are increased.



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(71)Applicant : CHISSO CORP

(72)Inventor : OGATA SATOSHI
NAGAE KAZUYUKI
NISHIO KAZUE

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(54) BLENDED ULTRA-FINE FIBER GOOD AND ITS PRODUCTION

(57)Abstract:

PURPOSE: To readily produce a cylindrical filter excellent in compressive strength and filtration accuracy and having a long filtration life and an ultra-fine fiber web or nonwoven fabric suitable for production of this cylindrical filter and to provide a method for producing the web, the nonwoven fabric or the cylindrical filter.

CONSTITUTION: There are provided a web made of blended ultra-fine fibers, nonwoven fabric produced by heat-treating the web and a cylindrical filter produced by winding this web or this nonwoven fabric and heat-treating it. The above-mentioned blended ultra-fine fibers are produced according to the melt blow spinning method and composed of a high-melting ultra-fine fiber and a low-melting ultra-fine fiber having melting points 10°C or more different from each other respectively. The ratio of the low-melting ultra-fine fiber contained in the blended ultra-fine fibers is 10 to 90wt.%.

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2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the super-thin mixture fiber by which spinning was carried out by the melt blowing method, the textiles which consist of this super-thin mixture fiber, and those manufacturing methods. It is related with the textiles which consist of high-melting point super-thin fiber and low melting point super-thin fiber with a melting point difference 10 degrees C or more in more detail, and consist of super-thin mixture fiber which contains low melting point super-thin fiber ten to 90% of the weight in mixed fiber, and those manufacturing methods. Specifically, pressure resistance and a filtration accuracy are related with the good long tubed filter of a filtration life.
[0002]
[Description of the Prior Art] Super-thin fiber is processed into a nonwoven fabric or a Plastic solid, and is widely used for the facing of a disposable bundle, protection-against-dust garments, the mask, the wiping cross, the fine filter, etc. as a fine filter -- the filter of the penetrant remover of an electronics manufacturing process, an air filter, and a drug -- there is a use of the pre-filter of service water, a food, the microorganism removal filter of potable water, etc., etc. The manufacture method of the super-thin fiber nonwoven fabric which carries out degradation of the thermoplastics to hypoviscosity within spinning equipment, and carries out spinning to JP,54-134177,A by the melt blowing method is indicated. Moreover, the manufacture method of the super-thin bicomponent-fiber nonwoven fabric which JP,60-99057,A is made to compound two kinds of thermoplastics with a parallel connected type, and carries out spinning to it by the melt blowing method is indicated. As a filter, a micro fiber is accumulated on a mandril and the fine filter with fixed voidage which maintains structure only in relation to [a fiber comrade] mechanical is indicated by JP,60-216818,A. In the filter which winds up and obtains a nonwoven fabric, the filter using the big nonwoven fabric of the diameter of fiber and an aperture is indicated by JP,1-297113,A, so that it becomes the outside of a filter. The cartridge filter which becomes JP,4-126508,A from the super-thin bicomponent fiber made by the melt blowing method is indicated, and the cartridge filter from which the diameter of fiber which becomes JP,5-96110,A from the super-thin bicomponent fiber made by the melt blowing method changed one by one is indicated.
[0003]
[Problem(s) to be Solved by the Invention] Since structure was mainly maintained by interlacement of fiber, the nonwoven fabric which consists of super-thin fiber of the conventional single component had the fault that a low and a fuzz had much intensity, and was unsuitable to the facing of a disposable bundle. If it heat-treats using a heating roller etc., fiber dissolves, and a nonwoven fabric will tend to become film-like and will become that in which feeling was inferior, in order to raise the intensity of such a nonwoven fabric. moreover, since there is little adhesion between fiber, a degree of hardness is low in changing a filtration accuracy by heat sterilization processing, elevated-temperature filtration, or vibration, and the filter using the super-thin fiber of the conventional single component has an inadequate pressure resistance -- etc. -- there was a fault furthermore, the compound melt blowing method -- spinneret equipment -- complicated -- expensive -- each regurgitation -- there was a problem

that the melting viscosity control for supplying different-species polymer equally was difficult for a hole

[0004]
[Means for Solving the Problem] This invention persons the high-melting point resin and low melting point resin which have a melting point difference 10 degrees C or more as a result of repeating research wholeheartedly that the above-mentioned technical problem should be solved, adjusting so that it may become 10 - 90% of the weight of all extruder capacity about the extruder capacity of a low melting point resin When the super-thin mixture fiber web which consists of the high-melting point super-thin fiber and low melting point super-thin fiber which are obtained by carrying out spinning by the melt blowing method using each extruder performs the suitable fabricating operation and suitable heat treatment for this It knows that it will be processible into the nonwoven fabric and tubed filter of the outstanding property, and came to complete this invention. this invention is explained in detail below.
[0005] the melt blowing method -- spinning -- the fused thermoplastics which was extruded from the hole It sprays on the hollow mandril which rotates [which rotates and uptake-conveyer-nets] with the elevated-temperature high-speed gas which blows off from the circumference of a hole. spinning -- It is the method of obtaining a fiber web. Van, A, and UENTE (Van A Wente), Industrial - and the 48th volume (Industrial and Engineering Chemistry) of - engineering chemistry, It is indicated by the 1342-1346th pages (1956) of an octavus number, "super fine thermostat plastics (Super Fine Thermoplastics)", and U.S. Pat. No. 3,532,800. the air for 0.5-10kg/cm2andG, 200-500 degrees C, and 1-100m3/, inert gas, etc. usually use for an elevated-temperature high-speed gas -- having -- spinning -- the distance with a hole, a uptake conveyer network, or a hollow mandril -- usually -- it is 20-50cm still more preferably 15-60cm preferably about 5-80cm
[0006] spinning with a low melting point resin and a high-melting point resin separate [the super-thin mixture fiber web of this invention] -- it is manufactured by the melt blowing method using the spinneret breathed out from a hole, and a low melting point resin and a high-melting point resin are sent into a spinneret by each extruder According to this method, the web which two kinds of super-thin fiber 20 micrometers or less mixed [the diameter of fiber] is obtained easily. The spinneret for a melt blow of various kinds of form can be used for manufacture of a super-thin mixture fiber web. one set of for example, the spinneret indicated by U.S. Pat. No. 3,981,650 -- the spinning of a high-melting point resin -- the spinning of a hole and a low melting point resin -- that to which the hole was located in a line with the single tier by turns can be used Moreover, the spinneret for high-melting point resins and the spinneret for low melting point resins may be used together, and the laminating of the low melting point super-thin fiber web and high-melting point super-thin fiber web which are obtained by each spinneret may be carried out. Furthermore, needle punch etc. can be processed to this laminated material, and the mixed state of fiber can also be improved. In order to obtain the super-thin mixture fiber web of the more uniform mixed state, the method using the spinneret indicated by U.S. Pat. No. 3,981,650 is desirable. When using two or more spinnerets, the amount of the low melting point super-thin fiber in super-thin mixture fiber can be adjusted by using the spinneret for super-thin bicomponent fibers indicated by the either at JP,60-99057,A. the spinning assigned to a low melting point resin and a high-melting point resin -- the content of the low melting point resin fiber in super-thin mixture fiber can be changed by changing the number of holes or changing the extruder capacity of each resin moreover, the spinning of each resin -- per hole -- ** -- the mixture of the super-thin fiber from which fineness differs is obtained by carrying out spinning with an extrusion outlet Furthermore, the super-thin mixture fiber web from which the diameter of fiber changed continuously or gradually spinning conditions, such as an extrusion outlet of a resin and spray velocity of an elevated-temperature high-speed gas, with time by changing with-time ** can be obtained. Thus, when the after-mentioned heat-treats this, let the super-thin mixture fiber web to which the diameter of fiber was changed be the tubed filter from which the diameter of fiber changed one by one along the filtration direction.
[0007] the low melting point resin and high-melting point resin which are used for manufacture of the super-thin mixture fiber web of this invention -- the difference of the melting point -- 10 degrees C or more -- 15 degrees C or more of 30 degrees C or more of two kinds of a certain thermoplastics are used

still more preferably preferably If the difference of the melting point is less than 10 degrees C, in case a super-thin mixture fiber web will be heat-treated and it will be processed into a nonwoven fabric, a filter, etc., not only low melting point super-thin fiber but high-melting point super-thin fiber softens or dissolves, it is easy to lose a fiber configuration, and the whole super-thin mixture fiber web may film-ize. If a super-thin mixture fiber web film-izes, since the nonwoven fabric obtained becomes the bad thing of the feeling which was [nature / water flow / flexibility, elasticity, permeability,] inferior and becomes the low thing of a filtration efficiency with a filter, it is unsuitable. In addition, the melting point here means the temperature of the endothermic peak generally measured with a differential scanning calorimeter (DSC). Softening temperature can be substituted although the melting point does not necessarily appear clearly in the case of amorphous thermoplastics, such as low melting point copolymerized polyester.

[0008] As thermoplastics used for the super-thin mixture fiber web of this invention, thermoplastics, such as a polyamide, polyester, low melting point copolymerized polyester, polystyrene, a polyurethane elastomer, a polyester elastomer, polypropylene, polyethylene, and copolymerization polypropylene (for example, making a propylene into a subject duality or a ternary polymerization object with ethylene, butene-1, and 4-methyl pentene-1 grade), can be illustrated. As an example of combination of the above-mentioned thermoplastics, although polyethylene/polypropylene, copolymerization polypropylene / polypropylene, low melting point copolymerized polyester / polyester, and polyethylene/polyester can be shown, it is not limited to such combination. Also in this, the combination of copolymerization polypropylene / polypropylene, and low melting point copolymerized polyester / polyester has the strong junction force of the fiber by heat treatment, and since a fiber moldings with intensity is obtained, it is desirable.

[0009] Reproduction resin is sufficient although it is desirable that it is virgin resin as for these thermoplastics. Since influence is hardly received in spinning nature by the melt blowing method even if it is the raw material which the thread breakage generates somewhat by the usual spinning method, if only the kind and the melting point of a resin are clear, reproduction resin can also be used, and it is economical.

[0010] The super-thin mixture fiber web of this invention contains low melting point super-thin fiber 30 to 50% of the weight more preferably 20 to 70% of the weight ten to 90% of the weight in mixed fiber. When the content of the low melting point super-thin fiber in a super-thin mixture fiber web is less than 10 % of the weight, the nonwoven fabric and tubed filter which heat-treat a web and are obtained have few thermal-bond points of fiber, and since they will become weak [intensity with much hair Hadachi], they are not desirable. Moreover, if the content of low melting point super-thin fiber exceeds 90 % of the weight, since the low melting point super-thin fiber which lost the fiber gestalt with heat treatment will come to bury fiber interspace spare time and will cause film-izing of a nonwoven fabric, a fall of feeling, or a fall of the filtration capacity of a filter, it is not desirable.

[0011] Although there is no special limit in the diameter of fiber of the super-thin mixture fiber web of this invention, by adopting the melt blowing method, super-thin fiber 20 micrometers or less can be used, and a thing (15-0.1 micrometers and further 10-0.5 micrometers) is obtained by selection of spinning conditions. Let the super-thin mixture fiber web [micrometers / or less / 20] it is / web / be the filter with which the diameter of fiber was suitable for precision filtration when the after-mentioned / this / heat-treated. The diameter of fiber of high-melting point super-thin fiber and the diameter of fiber of low melting point super-thin fiber do not necessarily need to be the same. Moreover, although the above-mentioned super-thin mixture fiber is mainly used for the super-thin mixture fiber web used for the tubed filter of this invention, fiber of 20 micrometers or more of diameters of fiber may be mixed in the range which does not spoil a filtration accuracy.

[0012] The nonwoven fabric of this invention heat-treats the above-mentioned super-thin mixture fiber web, and is obtained. Heat treatment is performed at the temperature of the range between the softening temperature of the low melting point super-thin fiber of a super-thin mixture fiber web, and the softening temperature of high-melting point super-thin fiber. The method that the thermocompression bonding by the heating embossing roll, the air through method with heating air, or the method by the

infrared lamp etc. is well-known as the method of heat treatment can be used. While high-melting point super-thin fiber had maintained the fiber gestalt with heat treatment, weld of low melting point super-thin fiber is fixed, and it becomes the three-dimensions network structure. Thus, the obtained nonwoven fabric has the detailed opening between fiber by which the diameter of fiber was constituted from super-thin fiber 20 micrometers or less, and its feeling is flexible, and it does not have a fuzz, either, and it has the outstanding property to be high intensity. Based on such an outstanding property, the nonwoven fabric of this invention can be used for the facing of a disposable bundle, protection-against-dust garments, a mask, a wiping cross, an air filter, etc.

[0013] It consists of super-thin mixture fiber by which spinning was carried out by the melt blowing method, and hot forming of the nonwoven fabric from which the solid-like moldings of the invention in this application with which high-melting point super-thin fiber is being fixed by weld of the low melting point super-thin fiber contained ten to 90% of the weight in mixed fiber heat-treated an above-mentioned super-thin mixture fiber web or the above-mentioned above-mentioned super-thin mixture fiber web, and the mixed fiber of high-melting point super-thin fiber and low melting point super-thin fiber with a melting point difference 10 degrees C or more was obtained is carried out, and it is obtained. Thus, the obtained solid Plastic solid has the detailed opening between fiber which consisted of super-thin fiber, its feeling is flexible, and it does not have a fuzz, either, and has the feature that a solid configuration cannot collapse easily due to the outstanding property to be high intensity, and the three-dimensions network structure to which high-melting point super-thin fiber was fixed by weld of low melting point super-thin fiber, and has the use of a medical-application mask, a dust respirator, a shoulder pad, etc. Let the nonwoven fabric and solid moldings of this invention be an electret filter. The method of processing very much a mixed fiber web, a nonwoven fabric, or the moldings that carried out hot forming of this as a method of using as an electret filter by direct-current corona discharge with a voltage of about 1-30kV etc. is used, and it is 2 about 10-45C/cm. What has surface **** density is desirable.

[0014] The mixed fiber of the high-melting point super-thin fiber and low melting point super-thin fiber which consist of super-thin mixture fiber by which spinning was carried out by the melt blowing method, and have a melting point difference 10 degrees C or more The tubed filter of this invention with which high-melting point super-thin fiber is being fixed by weld of the low melting point super-thin fiber contained ten to 90% of the weight in mixed fiber The super-thin mixture fiber by which spinning was carried out by the aforementioned melt blowing method as indicated by U.S. Pat. No. 4,594,202 It can obtain by rolling round on the mandril which is rotating while conveying the method of making it deposit on the revolving mandril of permeability, the aforementioned super-thin mixture fiber web, or a nonwoven fabric by network conveyer as indicated by U.S. Pat. No. 4,100,009. a super-thin mixture fiber web or the amount of eyes of a nonwoven fabric -- 3 - 1000 g/m2 -- desirable -- 4 - 700 g/m2 Since it can be used and fixation of the high-melting point super-thin fiber by weld of low melting point super-thin fiber can be realized certainly and homogeneously with the below-mentioned heat treatment, it is most desirable for the amount of superintendent officers to be two or less 100 g/m.

[0015] Also in which method, it heat-treats on the occasion of winding at the temperature of the range between the softening temperature of the low melting point super-thin fiber of super-thin mixture fiber, and the softening temperature of high-melting point super-thin fiber. There is a method of heating a web or a nonwoven fabric or a method of heating the super-thin mixture fiber rolled round on the mandril in heat treatment. The method that the thermocompression bonding by the heating embossing roll, the air through method with heating air, or the method by the infrared lamp etc. is well-known as the method of heating can be used. Since a web without thickness spots can be rolled round since the method of heating a web or a nonwoven fabric by the air through method with heating air in these does not disturb the fiber order of a web, and the whole heating surface can be heated uniformly, the tubed filter by which quality, such as a filtration accuracy, was stabilized is obtained. When making it deposit on the mandril of permeability which is rotating without making the super-thin mixture fiber by which spinning was carried out by the melt blowing method cool and rolling round, even if it does not perform positive heat-treatment, the thermal bond of the high-melting point super-thin fiber can be carried out by the self-

heating to hold. Thus, since the obtained tubed filter consists of super-thin mixture fiber, its filtration accuracy is high, since high-melting point super-thin fiber is fixed by weld of low melting point super-thin fiber and the three-dimensions network structure is made, by heat sterilization processing, elevated-temperature filtration, or vibration, a filtration accuracy is not changed but the big tubed filter of a pressure resistance is obtained.

[0016] In case a super-thin mixture fiber web or a nonwoven fabric is processed into a tubed filter, the further excellent tubed filter is obtained by changing the diameter of fiber of the super-thin mixture fiber to be used one by one. For example, if it is a big diameter of fiber one by one as the diameter of fiber at the time of the winding start of a super-thin mixture fiber web is small and winding advances, the size (it may be hereafter called the aperture of a filter layer) of the opening between fiber inside a filter will become small one by one (going inside from the outside of a filter) along the filtration direction of a filter. By applying the particle from which grain size differs to the interior from the front face of a filter, such a filter classifies from coarse grain to grains, and since a uptake can be carried out, it turns into a long filter of a filtration life. Moreover, if it is an again big diameter of fiber after considering as the once small diameter of fiber as the diameter of fiber at the time of the winding start of a super-thin mixture fiber web is large and winding advances, the filter which has the feature that a pressure resistance is still larger will be obtained besides the feature of the above-mentioned long filtration life.

[0017] such a big effect is acquired, and with [the ratio (the diameter of the maximum fiber / diameter of the minimum fiber) of the diameter of the maximum fiber and the diameter of the minimum fiber] double precision [more than], an effect is remarkable and is four to 15 times more preferably three to 20 times that change of the diameter of fiber is large in the case of which . It faces manufacturing super-thin fiber by the melt blowing method, and as a means to change the diameter of fiber, by being able to make the diameter of fiber thick, and decreasing the extruder capacity of thermoplastics conversely, or gathering the rate of flow of a blowing air current, the diameter of fiber can be made thin and it can also use further combining these meanses by increasing the extruder capacity of thermoplastics or reducing the rate of flow of a blowing air current. There is a method of changing the pressure applied to the super-thin mixture fiber web or nonwoven fabric rolled round on a rotation mandril as other methods for obtaining the filter from which the aperture of a filter layer changed one by one along the filtration direction of a filter one by one. For example, if it is a pressure small one by one as the pressure at the time of the winding start of a super-thin mixture fiber web is large and winding advances, the aperture of a filter layer will become small one by one (going inside from the outside of a filter) along the filtration direction of a filter. Thus, the obtained filter has the feature that a filtration life is long, like the filter which the aforementioned diameter of fiber was changed from smallness to size, and was obtained.

[0018] Moreover, the filter from which the aperture of a filter layer changed with size, smallness, and size one by one (going inside from the outside of a filter) along the filtration direction of a filter is obtained by changing the pressure applied at the time of winding in order of smallness, size, and smallness. Thus, the obtained filter has the feature that a filtration life is long and a pressure resistance is large, like the filter which the aforementioned diameter of fiber was changed with size, smallness, and size, and was obtained. with [the ratio (the maximum aperture / the minimum aperture) of such big effect ****** that change of an aperture is large in the case of which, the maximum aperture, and the minimum aperture] double precision [more than], an effect is remarkable and is four to 15 times more preferably three to 20 times Change of the diameter of fiber or an aperture may be continuous, and may be gradual. Its inner thing is common from outside, and its aperture is small or the filtration direction of a tubed filter has the small diameter of fiber of the tubed filter inside in this case. However, it may be reverse and the disposal after use of a tubed filter is easy in this case.

[0019] Let the tubed filter of this invention be an electret filter. The method of processing a super-thin mixture fiber web, a nonwoven fabric, or the tubed filter that rolled round and manufactured this as a method of using as an electret filter by direct-current corona discharge with a voltage of about 1-30 kilovolts etc. is used, and it is 2 about 10-45C/cm. What has surface **** density is desirable. The high-melting point super-thin fiber of this invention may be a bicomponent fiber of a high-melting point component and a low melting point component, by this bicomponent fiber, has pressure resistance more

and serves as a tubed filter by which the filtration accuracy was stabilized. Moreover, the tubed filter with which it could be the bicomponent fiber of a high-melting point component and a low melting point component, and low melting point super-thin fiber also has pressure resistance more, and the filtration accuracy was similarly stabilized by this and 7s **.

[0020] Although it has pressure resistance enough even if the tubed filter of this invention does not have a green sand core, there may be a green sand core. The cross-section configuration of a green sand core is circular, and also an ellipse form, a triangle, a square, and the polygon beyond it are sufficient as it. The tubed filter as used in the field of this invention is that the configuration of the cross section of a filter is circular, or cylinder-like filters, such as an ellipse form, or the tubed filter with which the configuration of the cross section carried out the triangle or the polygon more than square. In addition, although, as for the appearance of a filter, a polygonal form tends to become near circularly as a fiber web is rolled and piled up, when the configuration of a green sand core is a polygon, there is no influence on a filter shape. The tubed filter of this invention can be widely used for filters for penetrant removers, such as a charge of electronic equipment material, the air filter for dust removing, and medical supplies as pre-filters, such as ******, food, a drink, and an alcoholic beverage, etc.

[0021]

[Example] Next, an example explains this invention still more concretely. In addition, the physical-properties value shown in the example was measured by the following methods.

One filter is attached in [filtration-accuracy] housing, and circulation water flow is carried out with a pump from a 30l. tank. It is a cake to the tank after adjusting a flow rate to 30l./m. (a Carborundum, #4000) 5g adds. From cake addition, 100ml of filtered water was extracted after 1 minute, it filtered by the membrane filter (what can carry out the uptake of the particle with a particle size of 1 micrometers or more), the grain size of the cake by which the uptake was carried out on the membrane filter was measured with the particle-size-distribution measurement machine which measures the number for every particle size, and maximum-flow appearance particle size was made into the filtration accuracy.

[0022] From a [diameter of average fiber] web, or the interior of a filter, five places are sampled respectively and an one-sheet each electron microscope photograph is taken. 20 arbitrary diameters of fiber were measured from one photograph, and it asked for the diameter of average fiber from a total of 100.

[Aperture] bubble-point circuit tester - was used, and it asked for the maximum aperture (micrometer) by the method of setting to ASTM-F -316-86. In addition, the aperture sampled and measured the nonwoven fabric rolled round on the rotating mandril.

One filter is attached in [filtration life and pressure-resistance] housing, and circulation water flow is carried out with a pump from a 30l. tank. After setting a flow rate as 30l./m, it adds 0.4g (whiting of 3.5 micrometers of : [16 sorts of] mean particle diameters of JISZ8901) of cakes at a time at intervals of 1 minute in a tank. Continuing addition of a cake, water flow circulation is continued and the differences of the water pressure of the entrance of a filter and an outlet are 3 kg/cm2. Time at the time of ****** (minute) was made into the filtration life. Furthermore addition and water flow circulation of a cake are continued, and when differential pressure becomes 10 kg/cm2 or a filter deforms, it ends. It is pressure-resistance 10 kg/cm2 which makes a pressure resistance a pressure (kg/cm2) when a filter deforms, and does not deform. It considered as the above.

[0023] [example 1] -- the spinning of the high-melting point fiber whose aperture is 0.3mm -- a hole and the spinning of low melting point fiber -- the hole was located in a line with the single tier by turns -- the total -- a hole -- the spinneret for a melt blow of a-501 number -- using -- spinning temperature -- 280 degrees C -- carrying out -- MFR -- 80 (g / 10 minutes, at230 degree C) 60ga part for /and MFR are the discharge quantity of polypropylene of 165 degrees C of melting points 124 (g / ten parts) the line of at190 degree C and 122 degrees C of melting points -- the discharge quantity of a low density polyethylene by 60g/ Consider the total discharge quantity as a part for 120g/, and spinning is carried out on the conditions which decrease continuously the pressure of blowing air with a temperature of 350 degrees C from early 3.1kg/cm2andG gradually to 0.5 kg/cm2 and G of the last stage. It sprayed on the conveyer network with an aspirator, and the mixing ratio of high-melting point super-thin fiber and low

melting point super-thin fiber obtained the amount of eyes of 49.0g/the super-thin mixture fiber web of m2 by 50/50 (weight). In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds.
[0024] This super-thin mixture fiber web was heated by 15m a part for /and the air through finishing machine of the conditions of 140 degrees C of ambient temperature in speed, and it rolled round on the metal mandril with an outer diameter of 30mm immediately, it was left in the room temperature, and carried out after the cold. The mandril was sampled after cooling, the remaining fiber moldings was cut, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. As a result of measuring the sample sampled from the super-thin mixture fiber web in spinning, the diameter of average fiber was 8.1 micrometers on 3.7 micrometers and the outside front face in 10mm from 1.9 micrometers and the inside from 1.1 micrometers and the inside in the inside front face of a filter at 5mm. High-melting point super-thin fiber pasted up this cylinder-like filter by weld of low melting point super-thin fiber, and the three-dimensions network structure was formed. The maximum aperture of this filter was 75 micrometers on 12 micrometers and the outside front face in the inside of a filter. When the filtration efficiency of this filter was measured, 7.4 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 2.5 micrometers and a filtration life are 48 minutes, and no foaming is in filtered water.
[0025] [Example 2] The spinneret used in the example 1 is used and it is spinning temperature 280 degrees C The discharge quantity of polyester of intrinsic viscosity 0.61 and 252 degrees C of melting points A part for 36g/, the same line as what was used in the aforementioned example 1 -- the discharge quantity of a low density polyethylene by 84g/ The total discharge quantity is considered as a part for 120g/. the pressure of blowing air with a temperature of 400 degrees C Spinning is carried out on the conditions which decrease continuously 0.4 kg/cm2 and G of the last stage gradually from early 2.8kg/cm2andG. It sprayed on the conveyer network with an aspirator, and the mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber obtained the amount of eyes of 51.0g/the super-thin mixture fiber web of m2 by 30/70 (weight). In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. This super-thin mixture fiber web was heated like the example 1, was rolled round, and the cylinder filter was obtained. As a result of measuring the sample sampled from this super-thin mixture fiber web, the diameter of average fiber was 1.8 micrometers on the inside front face of a filter, and was 9.2 micrometers on ****** and the outside front face in the thickness direction. High-melting point super-thin fiber pasted up this tubed filter by weld of low melting point super-thin fiber, and the three-dimensions network structure was formed. The maximum aperture of this filter was 84 micrometers on 20 micrometers and the outside front face in the inside of a filter. When the filtration efficiency of this filter was measured, 7.4 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 4.5 micrometers and a filtration life are 67 minutes, and no foaming is in filtered water.
[0026] [Example 3] Carry out spinning by the same method as an example 2 except having considered discharge quantity of 48g a part for /and intrinsic viscosity 0.55, and the ethylene glycol terephthalate isophthalate copolymer of 205 degrees C of melting points as a part for 72g/, having considered the total discharge quantity for the discharge quantity of polyester of intrinsic viscosity 0.61 and 253 degrees C of melting points as a part for 120g/, and having made spinning temperature into 300 degrees C. The mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber obtained 40/60 (weight) of super-thin mixture fiber webs. In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. It had the suction mechanism, the above-mentioned super-thin mixture fiber web which is rotating by part for 10m/and which is breathed out by the metal green sand core of permeability with an outer diameter of 30mm from a spinneret was rolled round until blasting and the outer diameter were directly set to 62mm, the green sand core after radiationnal cooling was sampled to the room temperature, length was cut to 250mm, and the tubed filter was obtained. On the occasion of winding, it rolled round at the far-infrared heater, the ambient temperature of an object was heated at 140 degrees C, and the adhesive property of a super-thin mixture fiber web was improved. the result which measured the sample sampled from the web in spinning -- the spinning of two kinds of

polyester -- since the discharge quantity per hole differed, as for the filter, ******** and fine-size thread were intermingled by the inner layer and the outer layer The diameter of average fiber of the obtained tubed filter was 2.0 micrometers on the inside front face, and was 9.5 micrometers on ****** and the outside front face in the thickness direction. When the filtration efficiency of this filter was measured, 8.4 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 3.3 micrometers and a filtration life are 43 minutes, and no foaming is in filtered water.

[0027] [Example 4] They are the temperature of 330 degrees C of 290 degrees C and blowing air, and the conditions of pressure 1.9 kg/cm2 and G about spinning temperature using the spinneret used in the example 1. The polypropylene whose MFRs are 80 (g / 10 minutes, at230 degree C) and 165 degrees C of melting points, While MFR carries out equivalent **** of the propylene ethylene butene -1 random copolymer which are 65 (g / 10 minutes, at230 degree C) and 138 degrees C of melting points The total discharge quantity was made to increase from a part for 100g/of the first stage to a part for 200g/of the last stage gradually, spinning was carried out, it sprayed on the conveyer network with an aspirator, and the mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber obtained 50/50 (weight) of super-thin mixture fiber webs. In this super-thin mixture fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. Immediately, this super-thin mixture fiber web was heated by 15m a part for /and the air through finishing machine of the conditions of 145 degrees C of ambient temperature in speed, it rolled round to the metal green sand core of the right hexagon whose one side is 15mm, and after cooling radiationally to a room temperature, the green sand core was sampled, it cut in length of 250mm, and the tubed filter was obtained. The greatest place of 60mm and the minimum is 52mm, and the outer diameter of the obtained tubed filter became near in general circularly. As a result of measuring the sample sampled from the web in spinning, the diameter of average fiber was 0.9 micrometers on the inside front face of a filter, and was 7.7 micrometers on ****** and the outside front face in the thickness direction. When the filtration efficiency of this filter was measured, 7.2 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 2.1 micrometers and a filtration life are 40 minutes, and no foaming is in filtered water.

[0028] the spinning for carrying out the regurgitation of the [example 5] high-melting point fiber -- a hole -- the spinning for carrying out the regurgitation of the low melting point fiber to 351 hole -- a hole -- 0.3mm of apertures to which 150 hole was distributed equally -- the total -- a hole -- the mixed fiber type melt blow spinneret of a-501 number -- using -- spinning temperature -- 285 degrees C -- carrying out -- MFR122 (g / 10 minutes, 230 degrees C) They are /351 hole and MFR65 (g / ten parts) by 84g/about the discharge quantity of polypropylene of 165 degrees C of melting points. The discharge quantity of 230 degrees C and propylene ethylene butene -1 random copolymer of 138 degrees C of melting points by 36g//150 hole, Consider the total discharge quantity as a part for 120g/, and spinning of the pressure of the blowing air whose temperature is 360 degrees C is carried out on the conditions which decrease continuously 0.7 kg/cm2 and G of the last stage from early 3.4kg/cm2andG. It sprayed on the conveyer network with an aspirator, and the amount of eyes obtained [the mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber] the super-thin mixture fiber web of 50 g/m2 by 70/30 (weight). In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds.

[0029] This super-thin mixture fiber web was heated by 15m a part for /and the air through finishing machine of the conditions of 140 degrees C of ambient temperature in speed, and the nonwoven fabric to which the polypropylene fiber was fixed by heat weld of propylene ethylene butene -1 random copolymer was obtained. This nonwoven fabric was heated by the air through finishing machine like the example 1, was immediately rolled round on the metal mandril with an outer diameter of 30mm, was left in the room temperature, and was carried out after the cold. The mandril was sampled after cooling, the remaining fiber moldings was cut, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. the result which measured the sample sampled from the web in spinning -- the spinning of two kinds of resins -- since the discharge quantity per hole is the same -- the diameter of fiber of high-melting point super-thin fiber and low melting point super-thin fiber -- almost -- equal -- the diameter of average fiber -- the inside front face of a filter -- the inside to 0.8

micrometers and 7mm -- 2.2 micrometers and an outside front face -- 7.4 micrometers -- ****** The maximum aperture of this filter was 62 micrometers in 7 micrometers and the thickness direction by the inside of a filter in ****** and the outside front face. When the filtration efficiency of this filter was measured, 6.5 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 1.1 micrometers and a filtration life are 48 minutes, and no foaming is in filtered water.

[0030] The same spinneret as what was used in the [example 6] example 5, and two kinds of thermoplastics. It uses and spinning temperature is made into 285 degrees C. the discharge quantity of propylene ethylene butene -1 random copolymer by 84g//351 hole, Are used discharge quantity of polypropylene as /150 hole, and the total discharge quantity is used as a part for 120g/by 36g/. For temperature, a pressure is early 2.9 kg/cm2andG at 340 degrees C about the conditions of blowing air. Spinning is carried out on the conditions which decrease continuously 1.2 kg/cm2 and G of the shell last stage. It sprayed on the conveyer network with an aspirator, and the amount of eyes obtained [the mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber] the super-thin mixture fiber web of 50 g/m2 by 30/70 (weight). This web was processed like the example 5, and was carried out, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. As a result of measuring the sample sampled from the web in spinning, although some variations are accepted in the diameter of fiber of high-melting point super-thin fiber and low melting point super-thin fiber, it is almost equal, and from 1.4 micrometers and the inside, it is 2.9 micrometers and an outside front face in 7mm, is [the diameter of average fiber is the inside front face of a filter, and] 4.4 micrometers, and is ******. When the filtration efficiency of this filter was measured, 6.7 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 2.0 micrometers and a filtration life are 38 minutes, and no foaming is in filtered water.

[0031] Except having set the pressure of blowing air constant by 1.7 kg/cm2 and G in the [example 7] aforementioned example 1, it is the same conditions as an example 1, and the cylinder-like filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. the result which measured the sample sampled from the web in spinning -- the spinning of two kinds of resins -- since the discharge quantity per hole is the same -- the diameter of fiber of high-melting point super-thin fiber and low melting point super-thin fiber -- almost -- equal -- the diameter of average fiber -- all the layers of a filter -- setting -- 2.2 micrometers -- ****** When the filtration efficiency of this filter was measured, 7.0 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 4.1 micrometers and a filtration life are 22 minutes, and no foaming is in filtered water.

[0032] Except having set the pressure of blowing air constant by 1.2 kg/cm2 and G in the [example 8] aforementioned example 1, it is the same conditions as an example 1, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. the result which measured the sample sampled from the web in spinning -- the spinning of two kinds of resins -- since the discharge quantity per hole is the same -- the diameter of fiber of high-melting point super-thin fiber and low melting point super-thin fiber -- almost -- equal -- the diameter of average fiber -- all the layers of a filter -- setting -- 6.0 micrometers -- ****** When the filtration efficiency of this filter was measured, 7.6 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 5.8 micrometers and a filtration life are 35 minutes, and no foaming is in filtered water.

[0033] It is a part for spinning temperature [of 290 degrees C], and 60g/of discharge quantity about the polypropylene whose MFRs are 80 (g / 10 minutes, at230 degree C) and 165 degrees C of melting points using the spinneret used in the [example 9] example 1. Propylene ethylene butene -1 random copolymer whose MFRs are 65 (g / 10 minutes, at230 degree C) and 138 degrees C of melting points by part for spinning temperature [of 310 degrees C], and 60g/of discharge quantity The pressure of blowing air with a temperature of 340 degrees C from early 0.4kg/cm2andG In the middle, changed to 3.0kg/cm2andG, it was made to change to 0.4 kg/cm2 and G continuously again in the last stage, spinning was carried out, it sprayed on the conveyer network with an aspirator, and the mixing ratio of high-melting point super-thin fiber and low melting point super-thin fiber obtained 50/50 (weight) of super-thin mixture fiber webs. In this super-thin mixture fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. This super-thin mixture fiber web was heated by

12m a part for /and the air through finishing machine of the conditions of 145 degrees C of ambient temperature in speed, and it rolled round on the metal mandril with an outer diameter of 30mm immediately, it was left in the room temperature, and carried out after the cold. The mandril was sampled after cooling, the remaining fiber moldings was cut, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was obtained. As a result of measuring the sample sampled from the super-thin mixture fiber web in spinning, the diameter of average fiber was 8.3 micrometers on 0.8 micrometers and the outside front face in 8mm from 8.2 micrometers and the inside in the inside front face of a filter. High-melting point super-thin fiber pasted up this cylinder-like filter by weld of low melting point super-thin fiber, and the three-dimensions network structure was formed. The maximum aperture of this filter was [in the inside of a filter] 79 micrometers on 15 micrometers and the outside front face from 81 micrometers and the inside at 8mm. When the filtration efficiency of this filter was measured, 8.8 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 1.6 micrometers and a filtration life are 49 minutes, and no foaming is in filtered water.
[0034] Except having set the pressure of blowing air constant by 1.7 kg/cm2 and G in the [example 10] aforementioned example 1, spinning was carried out on the same conditions as an example 1, it sprayed on the conveyer network with an aspirator, and the mixing ratio of 2.2-micrometer high-melting point super-thin fiber and low melting point super-thin fiber obtained [each diameter of average fiber] the super-thin mixture fiber web of amount of eyes 49.0 g/m2 by 50/50 (weight). In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. The two-sheet laminating of this web was carried out, it heated for 5 minutes using the hot air drying equipment with a temperature of 140 degrees C, the cold press was carried out using the metal mold for shoulder pads, and the solid Plastic solid was created. This solid Plastic solid has neither a fluff nor a wrinkle, has moderate flexibility, and has been preferably used as a shoulder pad.
[0035] the spinning for carrying out the regurgitation of the [example 11] high-melting point fiber -- a hole -- the spinning for carrying out the regurgitation of 200 hole and the low melting point fiber -- a hole -- the spinning for carrying out the regurgitation of 200 hole and the parallel-connected-type bicomponent fiber -- a hole -- 0.3mm of apertures by which 101 hole was distributed equally -- the total -- a hole -- the mixed fiber type melt blow spinneret of a-501 number -- using -- spinning temperature -- 270 degrees C -- carrying out -- MFR122 (g / 10 minutes They are /200 hole and MFR65 (g / ten parts) by 48g/about the discharge quantity of polypropylene of 165 degrees C of melting points. The discharge quantity of 230 degrees C and propylene ethylene butene -1 random copolymer of 138 degrees C of melting points by 48g//2000 hole, The discharge quantity of the bicomponent fiber which consists of equivalence of the two above-mentioned kinds of polymer by 24g//101 hole, Consider the total discharge quantity as a part for 120g/, and the pressure of the blowing air whose temperature is 320 degrees C from early 0.6kg/cm2andG In the middle, spinning was carried out to 3.5kg/cm2andG, and 0.6 kg/cm2 and G of the last stage on the conditions decreased continuously, it sprayed on the conveyer network with an aspirator, and the amount of eyes obtained the super-thin mixture fiber web of 50 g/m2. In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds.
[0036] This super-thin mixture fiber web was heated by 15m a part for /and the air through finishing machine of the conditions of 146 degrees C of ambient temperature in speed, and the nonwoven fabric to which the polypropylene fiber was fixed by heat weld of propylene ethylene butene -1 random copolymer was obtained. This nonwoven fabric was heated by the air through finishing machine like the example 1, and was immediately rolled round on the metal mandril with an outer diameter of 30mm, and it was left in the room temperature and cooled. The mandril was sampled after cooling, the remaining fiber moldings was cut, and the tubed filter with the outer diameter of 60mm, a bore [of 30mm], and a length of 250mm was produced. As a result of measuring the sample sampled from the web in spinning, they are the inside front faces of a filter, and from 10.2 micrometers and the inside, the diameters of average fiber are 0.8 micrometers and an outside front face in 7mm, it is 9.8 micrometers, and they are ******. When the filtration efficiency of this filter was measured, 7.0 kg/cm2 and the filtration accuracy of the pressure resistance were the good things where 1.1 micrometers and a filtration life are 40

minutes, and no foaming is in filtered water.
[0037] [example of comparison 1] -- 0.3mm of apertures, and a hole -- the object for the single component-type melt blow of a-501 number -- a mouthpiece -- using -- MFR -- 68 (g / 10 minutes, at230 degree C) 120g a part for /and spinning temperature of the total discharge quantity carried out spinning of the polypropylene of 164 degrees C of melting points on condition that regularity ** of temperature pressure [of 380 degrees C] 1.4 kg/cm2 and G of 300 degrees C and blowing air, it sprayed on the conveyer network with an aspirator, 52.0g of eyes/and the super-thin fiber web of m2 were obtained, and it rolled round to the paper tube. In this super-thin fiber web, weak adhesion had occurred between fiber with the heat which fiber itself holds. This super-thin fiber web was heated by 15m a part for /and the air through finishing machine of the conditions of 170 degrees C of ambient temperature in speed, and the nonwoven fabric was obtained. Although this nonwoven fabric and fiber were welding, many wrinkles occurred by the intense thermal contraction, and they were judged to be an unsuitable thing by manufacture of a filter.
[0038] [Example of comparison 2] After rolling round to the metal green sand core with an outer diameter of 30mm and cooling radiationally to a room temperature, having carried out spinning of the spinning conditions to the aforementioned example 1 of comparison on these conditions, and heating the obtained super-thin fiber web by 15m a part for /and the air through finishing machine of the conditions of 165 degrees C of ambient temperature in speed, the green sand core was sampled and cut, and the tubed filter with the outer diameter of 60mm, a bore, and a length of Since the heating conditions of a super-thin fiber web were low temperature, generating of the wrinkling by the thermal contraction had them compared with the aforementioned example 1 of comparison than the aforementioned example 1 of comparison. [quite few] However, there was little weld of fiber, and when the obtained cylinder filter was pushed by hand, the grade which deforms simply was soft [the filter]. As a result of measuring the sample sampled from the web in spinning, the diameters of average fiber were 3.7 micrometers and simultaneously regularity on 3.7 micrometers and the outside front face in 10mm from the inside from 3.5 microns and the inside in the inside front face of a filter. The pressure resistance was [18 micrometers and the filtration life of 1.9 kg/cm2 and the filtration accuracy] 121 minutes when the filtration efficiency of this filter was measured.
[0039]
[Effect of the Invention] The tubed filter of this invention consists of the high-melting point super-thin fiber and low melting point super-thin fiber by which spinning was carried out by the melt blowing method and which are super-thin mixture fiber and have a melting point difference 10 degrees C or more, and into mixed fiber, the web which contains low melting point super-thin fiber ten to 90% of the weight is rolled round, and it heat-treats, and is obtained, high-melting point super-thin fiber is fixed by heat weld of low melting point super-thin fiber, and it forms the three-dimensions network structure. Since this tubed filter consists of super-thin fiber, its filtration accuracy is high, and since structure was fixed by weld of fiber and it is, even if there are no reinforcing materials in the interior, a pressure resistance is high, and there is no change of a filtration accuracy by sterilization processing, elevated-temperature filtration and vibration, momentary pressure variation, etc. moreover, it has the feature that boil the tubed filter of this invention to which the diameter of fiber or the aperture was changed along the filtration direction besides the above-mentioned feature, and its filtration life is long Since the spinning oily medicine was not contained, in order to remove an oily medicine, the process of washing beforehand is unnecessary in the tubed filter of this invention which consists of super-thin mixture fiber by which spinning was carried out by the melt blowing method, and has used it for it sanitarily also at the food field. According to the manufacture method of the tubed filter of this invention, since structure does not use complicated compound spinneret equipment, a highly efficient tubed filter is obtained by easy operation.

[Translation done.]